

DRAFT

ARSG Timeline for Reducing Metal Loading in Upper Animas River Basin 9/7/14

Below is a realistic timeline for addressing the major, mining-related metal loading issues in the Upper Animas Basin. The Animas River Stakeholders Group (ARSG) believes it is unlikely that this timeline will become condensed (*i.e.* shorter), and it is quite possible the timeline could be extended. There are a number of factors (legal, financial, and regulatory) that may affect the timing of certain actions below which are beyond the control of the group as a whole.

1	Continue to Gather the Requisite Knowledge to Understand the Problem	Ongoing
2	Continue to Pursue Innovative Technologies to Address the Problem	Ongoing
3	Pursue Funding and Resources for Solution	Present - 2016
4	Undertake Preparatory Work to Bulkhead Red & Bonita	Fall - 2014
5	Open Up and Explore Gold King #7 Level for Potential Remediation Actions	Fall - 2014
6	Characterize Arrastra Gulch	January 2015
7	Finalize EPA Aquatic Ecological Risk Assessment	May 2015
8	Bulkhead Red & Bonita	2015
9	Analyze Impact of Red & Bonita Bulkhead	Commencing 2015
10	Remediate Bullion King Mine Waste	2015
11	Explore Remediation of Henrietta Mine Waste from levels 1, 2, and 3.	2015
12	Select Preferred Solution with Regard to Upper Cement Creek	November 2016
13	Commence Engineering of Preferred Solution	December 2016
14	Implementation of Preferred Solution	June 2017

Explanatory Notes:

- 1.) ARSG has collected and analyzed monthly water quality data for over 20 years from four gaging stations around Silverton with the assistance of many partners. This data is invaluable in showing the long-term changes in water quality as certain actions are undertaken in the Upper Animas Basin. It will continue to be collected. Over the past few years, EPA, BLM and USGS have been collecting significant amounts of water quality data from a number of locations around Cement Creek and the Animas River above and below Silverton. This more recent information will help define current water quality conditions and, when compared to data collected 10 – 15 years ago, will highlight changes water quality that may have been occurring. Fish and invertebrate surveys and sediment data are also being collected.
- 2.) Treating mine drainage using a traditional treatment plant over the long-term is very expensive. Although there are currently efforts to reduce the amount of water needed to be treated, some treatment may be needed in upper Cement Creek. ARSG has been actively searching for innovative methods of treatment by research, talking with consultants, attending conferences and posting a challenge for ideas with an award on the internet. The challenge has been completed and some ideas are being further investigated.
- 3.) There are several sources for funding. Sunnyside Gold Corp. (SGC) has offered \$6.5 million towards a solution, contingent on an agreement with regulatory agencies that SGC will have no

other future liabilities in the basin. By the time any preferred solution is implemented, with interest, the \$6.5 million will have grown to \$10 million. Also, there is \$4 million set aside in a trust to offset liabilities from ASARCO activities in upper portion of Arrastra Gulch. Most of these funds could be available for remediation in other parts of the basin depending on whether or not environmental remediation in Arrastra would be feasible and effective. In addition, EPA and BLM have dedicated significant resources towards investigative efforts towards a solution. EPA has committed to funding the opening of both the Red & Bonita and Gold King mines and bulkheading the Red & Bonita. Additional funds would be available if locations in the basin are designated for the National Priority List under CERCLA, although without an agreement SGC would not voluntarily provide the \$10 million.

- 4.) In 2012, EPA opened up the Red & Bonita mine for investigations. The mine discharges approximately 300 gpm of highly contaminated water and is one of the two biggest mining-related sources of metals in the basin. In 2013, EPA along with the Colo. Division of Reclamation, Mining and Safety (DRMS) thoroughly explored the accessible workings. For fall of 2014, EPA is planning on packer testing in locations thought to be suitable for bulkheading to determine hydraulic conductivity.
- 5.) EPA has entered into an agreement with the property owner of the Gold King to open up the collapsed portal at the #7 level to investigate the workings in fall of 2014. Mine drainage from the Gold King varies greatly depending on the time of year. At certain times, it is the biggest single mining-related source of metals in the basin. Underground investigation hopefully will help determine the locations of water infiltration and if anything can be done to prevent it.
- 6.) ARSG is working on a report characterizing water quality and the impacts from historic mining in Arrastra Gulch. Much of the characterization work was done ten years ago, and this effort will document if anything has changed. The report will provide some of the information for making decisions related to the use of the trust money related to the ASARCO settlement.
- 7.) Over the past couple of years, EPA and BLM have put substantial resources into developing an aquatic ecological risk assessment of the impacts to the Animas Basin caused by past mining activities. The main focus has been to assess impacts to aquatic and aquatic-dependent (ie American Dipper, Belted Kingfisher etc.) species through evaluation of their exposure to water sediments and potentially contaminated food. The assessment is meant to be a component in setting water quality goals and selecting effective remedies.
- 8.) EPA is planning to install a concrete bulkhead in the Red & Bonita in 2015 to greatly reduce the water flow from the mine.
- 9.) There is an expectation that a bulkhead in the Red & Bonita will not reduce the loading from that adit one hundred percent. There may be leakage in the workings around the bulkhead and/or water may find other drainage paths through fracture zones. However, if a bulkhead reduces metal loading by only 40-50% percent, it would probably still be cost-effective when compared to the cost of conventional AMD treatment. All parties are interested in identifying and monitoring locations where additional metal loading may occur as a result of the bulkhead.
- 10.) The Bullion King mine waste is the last mine waste site in Mineral Creek which was identified by ARSG for remediation that has not been remediated. Funding for the project will come from the 319 non-point source program. Overall, a variety of remediation projects in the

Mineral Creek drainage over almost twenty years have reduced low-flow concentrations of zinc by 50% and copper by 70%.

- 11.) In 2000, ARSG identified 32 mine waste sites in the whole basin that would be desirable to remediate. Most of those sites have been completed. One remaining site is the Henrietta levels 1, 2, and 3 in Prospect Gulch. ARSG will hopefully hear this fall if funding for remediation is available.
- 12.) Because of a large amount of metal loading over the last ten years from four draining adits in upper Cement Creek, ARSG's key focus is on developing potential solutions for managing this loading. A number of steps in identifying solutions are underway. They include: opening up and exploring the Red & Bonita and the Gold King, bulkheading the Red & Bonita and monitoring the hydrologic system response, and researching and testing less expensive methods of water treatment. Hopefully these steps and others will lead to a preferred solution for the metal loading. In addition, EPA is doing more investigations of the Animas River drainage above Silverton, beyond work previously done by ARSG, to see if other remediation efforts could cost-effectively reduce metal loading from this drainage.

To give a base case scenario with which to compare various solutions in Cement Creek, SGC has made the following estimates

Assuming the availability of only \$10M ("Base Case;"), SGC estimates that a 300 gpm lime treatment plant could be built for approximately \$4M, leaving approximately \$6M for O&M. (Utilizing a 7% discount rate, this would allow the plant to run for around 20 years.) SGC estimates that with the Base Case plant treating *Cement Creek water fairly near Gladstone* would reduce low flow Zn levels at CC-48 and A-72 respectively by approximately 41% and 18%.

Two other examples: 1) SGC estimates that treating the *water directly from the major adits* with a 300 gpm plant would reduce low flow Zn levels at CC48 and A-72 respectively by approximately 67% and 34%; and 2) SGC estimates that a 1,000 gpm plant (\$15M combined Capital and Operating expenses) *treating Cement Creek water fairly near Gladstone* would reduce low flow Zn levels at CC-48 and A-72 respectively by approximately 81 % and 34%.